

Nutrient and Dissolved Oxygen TMDL Development for Appoquinimink River, Delaware

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Region 3
1650 Arch Street
Philadelphia, Pennsylvania

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Executive Summary

The Appoquinimink River watershed drains approximately 47 square miles in New Castle County, Delaware, and is primarily agricultural with three residential/urban centers (Middletown, Odessa, and Townsend). The area is experiencing significant residential growth. The topography is generally characterized by flat to gently sloping land which is typical of the coastal plain. The Appoquinimink River system consists of three main tributaries, the Appoquinimink River main stem, Deep Creek, and Drawyer Creek. There are several shallow, man-made small lakes and ponds in the watershed (Wiggins Mill Pond, Noxontown Lake, Silver Lake, and Shallcross Lake). The Appoquinimink River is designated as a warm-water fishery and is subject to all water quality criteria specific to this designated use and those defined for general statewide water uses including aquatic life, water supply, and recreation. Due to their high nutrient concentrations and/or low dissolved oxygen levels, the Delaware Department of Natural Resources and Environmental Control (DNREC) identified and included in the state's 1996, 1998, and 2002 Section 303(d) lists of impaired waters several portions of the Appoquinimink River.

The Environmental Protection Agency Region III (EPA) establishes these Total Maximum Daily Loads (TMDLs) for the Appoquinimink River basin to address those stream segments impaired as a result of excess nutrients and low dissolved oxygen (DO). To address nutrient impairments, TMDLs have been established for total nitrogen (TN) and total phosphorus (TP) in order to attain and maintain applicable Water Quality Standards (WQS). There are presently no nutrient criteria defined by WQS for streams in the Appoquinimink River basin. Of the components of instream biological activity, only DO concentrations are included in water quality standards for stream segments of the Appoquinimink River basin. As a result, the nutrient TMDL endpoint is based on both the minimum and minimum daily average DO for the critical summer period characterized (June through September).

As part of the nutrient TMDLs, EPA has allocated specific amounts of TN and TP to nonpoint sources and point sources covered under storm water permits and flow, carbonaceous biochemical oxygen demand (CBOD), total kjeldahl nitrogen (TKN), and TP to the Middletown-Odessa-Townsend (MOT) WWTP located in the watershed. These allocations are necessary to restore and maintain applicable WQS for DO in the Appoquinimink River watershed.

TMDLs were determined for impaired segments and the subwatershed(s) contributing to them during the critical summer period (June through September). The total TMDL for each impaired segment is the combination of all TMDLs for contributing subwatersheds and for the MOT point source, where applicable. These watershed-based loads and the allocated load for the MOT WWTP enable the in-stream DO concentrations to meet criteria under all conditions. It should be noted that the WLAs for the storm water permits and the LAs for areas not covered by the storm water permits have been combined into a single WLA for each subwatershed (and impaired segment) and have not been presented separately. DNREC and New Castle County are

currently in the process of mapping storm water discharge locations that are covered by the permits, and as such, insufficient data are currently available to justify a more detailed allocation to the storm water permits. Once the mapping effort on behalf of DNREC and the county is complete, the TMDL can be refined to distribute the TMDL among the storm water permits (WLAs) and the nonpoint sources (LAs). The margin of safety (MOS) for this study was assumed implicit through conservative assumptions used in the modeling process.

The following tables summarize the TMDLs to address nutrient impairments for each stream segment of the Appoquinimink River basin included in the State's 303(d) list.

Table ES-1. TMDLs by contributing subwatershed for impaired waters of the Appoquinimink.

Segment Name	Segment ID	Contributing Subwatershed(s)	WLA	WLA
			TN (lbs/yr)	TP (lbs/yr)
Appoquinimink River (Lower)	DE010-001-01	1	14,074	1,707
		2	6,737	896
		3	1,547	231
		4	7,075	862
		5	7,388	1,024
		6	5,498	742
		7	6,954	874
		8	10,594	1,367
		9	5,366	693
		10	8,814	1,230
		The total TMDL for this segment also includes the WLAs for the MOT WWTP (Table ES-2)		
Appoquinimink River (Upper)	DE010-001-02	2	6,737	896
		5	7,388	1,024
		6	5,498	742
		7	6,954	874
		8	10,594	1,367
		The total TMDL for this segment also includes the WLAs for the MOT WWTP (Table ES-2)		
Drawyer Creek	DE010-001-03	1	14,074	1,707
		9	5,366	693
		10	8,814	1,230
Wiggins Mill Pond to confluence with Noxontown Pond	DE010-002-01	5	7,388	1,024
Deep Creek to confluence with Silver Lake	DE010-002-02	7	6,954	874
Noxontown Pond	DE010-L01	5	7,388	1,024
		6	5,498	742
Silver Lake	DE010-L02	7	6,954	874
		8	10,594	1,367
Shallcross Lake	DE010-L03	10	8,814	1,230

Note: A map of the Appoquinimink River basin and its subwatersheds is presented in Section 4.0

Table ES-2. WLAs for the MOT WWTP NPDES discharge (DE0050547).

Parameter	WLA
Flow	0.5 mgd
CBOD-5 day	34.8 lbs/day (12,702 lbs/year)
Total Kjeldahl Nitrogen (TKN)	10.4 lbs/day (3,796 lbs/year)
Total Phosphorus (TP)	2.1 lbs/day (766.5 lbs/year)

The TMDL represents one allocation scenario. As implementation of the established TMDL proceeds, DNREC may find that the applicable water quality standard can be achieved through other combinations of point and nonpoint source allocations that are more feasible and/or cost effective. If that happens, DNREC is free to re-run the model to propose a revised TMDL with an alternative allocation scenario that will achieve water quality standards. It should be noted that, by transferring loadings from one source to another, the results of the model may change even if the total loading remains the same because the proximity and timing of difference sources impacts the river differently.